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L4: Entry 12 of 19 File: JPAB Jan 31, 2003

PUB-NO: JP02003031790A
DOCUMENT-IDENTIFIER: JP 2003031790 A
TITLE: SEMICONDUCTOR DEVICE AND ITS FABRICATING METHOD

PUBN-DATE: January 31, 2003

INVENTOR-INFORMATION:

NAME	COUNTRY
UDA, KEIICHIRO	
SAITO, AKIRA	
OTA, KENJI	

ASSIGNEE-INFORMATION:

NAME	COUNTRY
SHARP CORP	

APPL-NO: JP2001216624
APPL-DATE: July 17, 2001

INT-CL (IPC): H01 L 27/15; H01 L 21/265; H01 L 31/10; H01 L 33/00

ABSTRACT:

PROBLEM TO BE SOLVED: To provide a semiconductor device which can be fabricated inexpensively while having a monolithic OEIC structure and exhibits a good signal transmission efficiency.

SOLUTION: A light emitting element 601 containing fine particles of semiconductor silicide, an MOSFET 604 for driving the light emitting element 601, a light receiving element 602 containing fine particles of semiconductor silicide, an MOSFET 606 for converting an optical signal received by the light receiving element 602 into an electric signal, and an optical waveguide 633 are formed on the SOI layer 13 of an SOI substrate. When the MOSFET 601 is turned, light is emitted from a light emitting region 614 and received by the light receiving element 602 through a waveguide 633 surrounded by a silicon oxide film, thus turning the MOSFET 602 on. Since the light emitting element 601 and the light receiving element 602 contain fine particles of semiconductor silicide, good light emitting efficiency and light receiving efficiency are ensured.

obtained at 30 GHz. The incorporation of a tungsten **silicide** layer below the buried silicon dioxide layer can be used as a ground plane. A tungsten **silicide** ground plane used with a standard SOI test structures was found to increase the suppression of cross-talk by 20 dB in the frequency range 1-10 GHz. Other potential applications such as ground plane and double-gate MOSFETs are discussed.

CC B2530F Metal-insulator-semiconductor structures; B2560J Bipolar transistors; B2570 Semiconductor integrated circuits; B2560H Junction and barrier diodes; B2560R Insulated gate field effect transistors; B2550B Semiconductor doping; B2550A Annealing processes in semiconductor technology

CT ANNEALING; BIPOLAR TRANSISTORS; BURIED LAYERS; MOSFET; P-I-N DIODES; SILICON-ON-INSULATOR; SUBSTRATES; WAFER BONDING

ST SOI substrates; **buried silicide layer**; wafer bonding; series resistance; out-diffusion; buried implanted collector contact; post-bond anneal; vertical complementary bipolar transistors; **silicon-on-silicide-on-insulator structure**; p-i-n diodes; **low loss coplanar waveguide lines**; polysilicon surface layer; microwave losses; MOSFET

ET B

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(FILE 'HOME' ENTERED AT 16:17:36 ON 21 SEP 2003)

FILE 'INSPEC' ENTERED AT 16:17:44 ON 21 SEP 2003

L1	7	WAVEGUIDE (P)SILICIDE
L2	0	PHOTODETECTOR PHOTODIODE
L3	159873	DIODE OR DETECTOR
L4	2	L1 AND L3

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=> d l1 1-7 all
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L1 ANSWER 1 OF 7 INSPEC (C) 2003 IEE on STN

AN 2002:7262991 INSPEC DN A2002-12-0762-037; B2002-06-7230C-035

TI Novel **waveguide** MSM photodetectors on SOI substrates using silicides.

AU Xu, D.-X.; Janz, S.; Cheben, P.; Delage, A. (Inst. for Microstructural Sci., Nat. Res. Council of Canada, Ottawa, Ont., Canada)

SO Proceedings of the SPIE - The International Society for Optical Engineering (2001) vol.4293, p.106-13. 11 refs.
Published by: SPIE-Int. Soc. Opt. Eng
Price: CCCC 0277-786X/01/$15.00
CODEN: PSISDG ISSN: 0277-786X
SICI: 0277-786X(2001)4293L.106:NWPS;1-5

Conference: Silicon-based and Hybrid Optoelectronics III. San Jose, CA, USA, 23-24 Jan 2001
Sponsor(s): SPIE

DT Conference Article; Journal

TC Practical; Experimental

CY United States

LA English

AB A novel Si **waveguide** MSM photodetector suitable for high speed/high quantum efficiency applications is proposed and demonstrated. Silicides are formed on a silicon-on-insulator (SOI) substrate through metal/Si reaction under heat treatment, in two areas separated by a narrow gap. The **silicide** sidewalls on the two sides of the narrow gap provide lateral **waveguide** confinement, and also serve as electrodes. The **silicide**/Si interface forms a Schottky junction, making the structure a MSM diode. The **waveguide** structure provides a long optical path length to increase the quantum efficiency at near infrared wavelengths. The distance between electrodes can be changed easily through photolithography, and can be made very small to reduce the transit time between electrodes for high-speed operation. Since the devices are made on SOI substrates, the drift component of the photocurrent can be eliminated, further facilitating high-speed operation. A first set of photodetectors was made using PtSi on commercially available SOI substrates with 0.34 mu m Si layer. Initial experiments have demonstrated a responsivity of near 200mA/W at lambda =980 nm for a detector with 486 mu m long electrodes and 2 mu m gap size. The dark current was on the order of 0.1 nA/ mu m2 at 5V bias.

CC A0762 Detection of radiation (bolometers, photoelectric cells, i.r. and submillimetre waves detection); A7340S Electrical properties of metal-semiconductor-metal structures; B7230C Photodetectors; B2530G Metal-insulator-metal and metal-semiconductor-metal structures; B2520C Elemental semiconductors

CT DARK CONDUCTIVITY; ELEMENTAL SEMICONDUCTORS; HEAT TREATMENT; METAL-SEMICONDUCTOR-METAL STRUCTURES; PHOTODETECTORS; SCHOTTKY BARRIERS; SILICON; SILICON-ON-INSULATOR

ST **waveguide MSM photodetector**; SOI substrate; heat treatment; **silicide sidewalls**; **lateral waveguide confinement**; Schottky junction; optical path length; quantum efficiency; photolithography; dark current; high speed optics; 980 nm; 0.34 micron; Si-SiO

CHI Si-SiO int, SiO int, Si int, O int, SiO bin, Si bin, O bin, Si el

PHP wavelength 9.8E-07 m; size 3.4E-07 m

ET Si; Pt*Si; Pt sy 2; sy 2; Si sy 2; PtSi; Pt cp; cp; Si cp; V; O*Si; O sy 2; SiO; O cp; Si-SiO; O

L1 ANSWER 2 OF 7 INSPEC (C) 2003 IEE on STN

AN 2001:7010595 INSPEC DN B2001-09-2530F-039

TI Silicon-on-insulator substrates with buried tungsten **silicide** layer.

AU Gamble, H.S.; Armstrong, B.M.; Baine, P.; Bain, M.; McNeill, D.W. (Sch. of Electr. & Electron. Eng., Queen's Univ., Belfast, UK)

SO Solid-State Electronics (April 2001) vol.45, no.4, p.551-7. 9 refs.
Doc. No.: S0038-1101(01)00075-2
Published by: Elsevier
Price: CCCC 0038-1101/2001/$20.00
CODEN: SSELA5 ISSN: 0038-1101
SICI: 0038-1101(200104)45:4L.551:SISW;1-B
Conference: EUROSOI-2000 (European Meeting on Silicon on Insulator Devices). Granada, Spain, 26-27 Oct 2000

DT Conference Article; Journal

TC Practical; Theoretical

CY United Kingdom

LA English

AB Tungsten **silicide** layers can be incorporated into

[redacted]

silicon-on-insulator (SOI) substrates produced by direct wafer bonding. The series resistance of collectors/drains in bipolar or smart-power circuits can be reduced to 2 Omega /sq. The out-diffusion of the buried implanted collector contact during the post-bond anneal can be eliminated by using rapid diffusivity of donors and acceptors in tungsten **silicide** subsequent to bond anneal. Optimisation of this process can provide better matching of vertical complementary bipolar transistors. A novel silicon-on-**silicide**-on-insulator structure is proposed for integrating p-i-n diodes with low loss coplanar **waveguide** lines. This incorporates a polysilicon surface layer on the high resistivity handle wafer and a tungsten **silicide** back contact to the diode. CPW lines with microwave losses of 2 dB/cm have been obtained at 30 GHz. The incorporation of a tungsten **silicide** layer below the buried silicon dioxide layer can be used as a ground plane. A tungsten **silicide** ground plane used with a standard SOI test structures was found to increase the suppression of cross-talk by 20 dB in the frequency range 1-10 GHz. Other potential applications such as ground plane and double-gate MOSFETs are discussed.

CC B2530F Metal-insulator-semiconductor structures; B2560J Bipolar transistors; B2570 Semiconductor integrated circuits; B2560H Junction and barrier diodes; B2560R Insulated gate field effect transistors; B2550B Semiconductor doping; B2550A Annealing processes in semiconductor technology

CT ANNEALING; BIPOLAR TRANSISTORS; BURIED LAYERS; MOSFET; P-I-N DIODES; SILICON-ON-INSULATOR; SUBSTRATES; WAFER BONDING

ST SOI substrates; **buried silicide layer**; wafer bonding; series resistance; out-diffusion; buried implanted collector contact; post-bond anneal; vertical complementary bipolar transistors; **silicon-on-silicide-on-insulator structure**; p-i-n diodes; **low loss coplanar waveguide lines**; polysilicon surface layer; microwave losses; MOSFET

ET B

L1 ANSWER 3 OF 7 INSPEC (C) 2003 IEE on STN

AN 2001:6876506 INSPEC DN B2001-05-7230C-013

TI Ultrafast Si-based MSM mesa photodetectors with optical **waveguide** connection.

AU Buchal, C.; Loken, M.; Siegert, M.; Roelofs, A.; Kappius, L.; Mantl, S. (Inst. fur Schicht- und Ionentech., Forschungszentrum Julich GmbH, Germany)

SO Materials Science in Semiconductor Processing (2000) vol.3, no.5-6, p.399-403. 10 refs.
Doc. No.: S1369-8001(00)00063-9
Published by: Elsevier
Price: CCCC 1369-8001/2000/$20.00
CODEN: MSSPFQ ISSN: 1369-8001
SICI: 1369-8001(2000)3:5/6L.399:UBMP;1-Q
Conference: Materials, Technologies and Applications for Optical Interconnect. Part of the 1999 E-MRS Spring Meeting. Strasbourg, France, 3-4 June 1999

DT Conference Article; Journal

TC Experimental

CY United Kingdom

LA English

AB We have fabricated ultrafast Si metal-semiconductor-metal photodetectors and connected them to optical waveguides. The photodetectors are fabricated in a vertical structure consisting of a top metallization (M1), epitaxial silicon, epitaxial metallic CoSi2 (M2) and a Si substrate. In the visible region, photons create electron-hole pairs in the epitaxial Si. At infrared wavelength the energy of the photons is not sufficient to create electron-hole pairs in the Si. In this case, the Schottky contacts of both metallizations provide electron and holes from internal photoemission. The best detectors show a pulse width of 3.2 ps full-width at half-maximum at 1.25 mu m wavelength and room temperature. We present

data for the coupling of the detectors to a monomode glass fiber and to polymer-based waveguides on the Si chip.
CC B7230C Photodetectors; B4130 Optical waveguides; B4250 Photoelectric devices
CT ELEMENTAL SEMICONDUCTORS; METAL-SEMICONDUCTOR-METAL STRUCTURES; OPTICAL WAVEGUIDES; PHOTODETECTORS; SILICON
ST **optical waveguide coupling**; ultrafast Si metal-semiconductor-metal mesa photodetector; electron-hole pair; Schottky contact; metallization; internal photoemission; monomode glass fiber; **polymer waveguide**; **epitaxial metallic silicide**; 1.25 micron
CHI CoSi2 int, Si2 int, Co int, Si int, CoSi2 bin, Si2 bin, Co bin, Si bin, Si el
PHP wavelength 1.25E-06 m
ET Si; Co*Si; Co sy 2; sy 2; Si sy 2; CoSi2; Co cp; cp; Si cp; CoSi; Co

L1 ANSWER 4 OF 7 INSPEC (C) 2003 IEE on STN
AN 2000:6736514 INSPEC DN A2000-23-6180J-002
TI Some interesting aspects of swift heavy ions in materials science.
AU Avasthi, D.K. (Nucl. Sci. Centre, New Delhi, India)
SO Current Science (10 June 2000) vol.78, no.11, p.1297-302. 15 refs.
Published by: Current Sci. Assoc
CODEN: CUSCAM ISSN: 0011-3891
SICI: 0011-3891(20000610)78:11L.1297:SIAS;1-T
DT Journal
TC General Review; Experimental
CY India
LA English
AB Irradiation of materials, by high energy, heavy ions (referred to as swift heavy ions or SHI), results in highly excited lattice atoms with negligible contribution from elastic collisions. Atomic displacements and structural modifications of such a lattice bring out interesting changes in the materials. **Silicide** formation at the interface in Ti/Si and Fe/Si has been observed due to electronic excitation-induced ion beam mixing. SHI irradiation of organic crystals shows significant changes in dielectric constant providing a possibility of making buried optical **waveguide** structures. The irradiated polymers after etching give micro-filters, which can be used in different ways. Ion track diameters have been estimated from the monitoring of hydrogen release, using elastic recoil detection, during ion irradiation of polymers. Possibilities of having an insight to varying damage zones inside a track are demonstrated.
CC A6180J Ion beam effects; A6475 Solubility, segregation, and mixing; A6822 Surface diffusion, segregation and interfacial compound formation; A6140K Structure of polymers, elastomers, and plastics; A7720 Dielectric permittivity; A4280L Optical waveguides and couplers
CT CHEMICAL INTERDIFFUSION; ION BEAM MIXING; OPTICAL WAVEGUIDES; ORGANIC COMPOUNDS; PERMITTIVITY; POLYMERS
ST swift heavy ions; highly excited lattice atoms; elastic collisions; atomic displacements; structural modifications; **silicide formation**; ion beam mixing; organic crystals; dielectric constant; **buried optical waveguide structures**; irradiated polymers; etching; micro-filters; hydrogen release; elastic recoil detection
ET Ti; Fe

L1 ANSWER 5 OF 7 INSPEC (C) 2003 IEE on STN
AN 1991:4001269 INSPEC DN A91144350
TI Molecular beam epitaxy growth of epitaxial barium **silicide**, barium oxide and barium titanate on silicon.
AU McKee, R.A.; Walker, F.J.; Conner, J.R.; Specht, E.D. (Oak Ridge Nat. Lab., TN, USA); Zelmon, D.E.
SO Applied Physics Letters (12 Aug. 1991) vol.59, no.7, p.782-4. 11 refs.
Price: CCCC 0003-6951/91/320782-03$02.00
CODEN: APPLAB ISSN: 0003-6951
DT Journal

TC Experimental
CY United States
LA English
AB Thin-film epitaxial structures of BaSi2, BaO, and BaTiO3, have been grown on the (001) face of silicon using ultrahigh vacuum, molecular beam epitaxy (MBE) methods. Source shuttering for the metal species coordinated with a pulsed, or cyclic, oxygen arrival at the growing oxide surfaces significantly improves film quality. The epitaxial growth of BaO is accomplished without silica formation at the BaO/Si interface by stabilizing BaSi2 as a submonolayer template structure. In situ ellipsometric measurements of the indices of refraction for BaO and for BaTiO3 in a BaTiO3/BaO/Si multilayer gave n=1.96 for BaO and n=2.2 for the BaTiO3, within 10% of their bulk values. These values suggest that this structure can be developed as an optical **waveguide**. BaO is impermeable to silicon for films as thin as 10 nm at temperatures as high as 800 degrees C, and good epitaxy can be obtained from room temperature to 800 degrees C. The epitaxy is such that BaTiO3(001)//BaO(001)//Si(001) and BaTiO33(110)//BaO(100)//Si(100).
CC A8115G Vacuum deposition; A6855 Thin film growth, structure, and epitaxy; A7865J Nonmetals
CT BARIUM COMPOUNDS; ELLIPSOMETRY; MOLECULAR BEAM EPITAXIAL GROWTH; OPTICAL FILMS; REFRACTIVE INDEX
ST thin film structures; ultrahigh vacuum deposition; ellipsometry; molecular beam epitaxy; epitaxial growth; interface; submonolayer template; indices of refraction; **optical waveguide**; 800 degC; BaSi2; BaO; BaTiO3; Si; BaTiO3-BaO-Si multilayer
CHI Si sur, Si el; BaTiO3-BaO-Si int, BaTiO3 int, TiO3 int, BaO int, Ba int, O3 int, Si int, Ti int, O int, BaTiO3 ss, TiO3 ss, Ba ss, O3 ss, Ti ss, O ss, BaO bin, Ba bin, O bin, Si el; BaSi2 bin, Si2 bin, Ba bin, Si bin; BaO bin, Ba bin, O bin; BaTiO3 ss, TiO3 ss, Ba ss, O3 ss, Ti ss, O ss
PHP temperature 1.07E+03 K
ET Ba*Si; Ba sy 2; sy 2; Si sy 2; BaSi2; Ba cp; cp; Si cp; Ba*O; BaO; O cp; Ba*O*Ti; Ba sy 3; sy 3; O sy 3; Ti sy 3; BaTiO3; Ti cp; C; BaTiO33; Si; Ba*O*Si*Ti; Ba sy 4; sy 4; O sy 4; Si sy 4; Ti sy 4; BaTiO3-BaO-Si; BaTiO; Ba*O*Si; Si sy 3; BaO-Si; O*Ti; TiO; Ba; O; Ti; BaSi

L1 ANSWER 6 OF 7 INSPEC (C) 2003 IEE on STN
AN 1991:3945981 INSPEC DN B91055333
TI Propagation of picosecond electrical pulses on a silicon-based microstrip line with buried cobalt **silicide** ground plane.
AU Roskos, H.; Nuss, M.C.; Goossen, K.W.; Kisker, D.W. (AT&T Bell Labs., Holmdel, NJ, USA); White, A.E.; Short, K.T.; Jacobson, D.C.; Poate, J.M.
SO Applied Physics Letters (10 June 1991) vol.58, no.23, p.2604-6. 13 refs.
Price: CCCC 0003-6951/91/232604-03$02.00
CODEN: APPLAB ISSN: 0003-6951
DT Journal
TC New Development; Theoretical; Experimental
CY United States
LA English
AB A microstrip line with a highly conducting cobalt **silicide** (CoSi2) ground plane buried 7 mu m below the surface of a single-crystal silicon wafer is presented. This new transmission line shows significantly reduced dispersion up to 100 GHz bandwidth compared to a conventional microstrip line with the ground plane on the back of the substrate, while being able to support active devices in the silicon dielectric. After propagating 5 mm, the rise time (10%-90%) of an electrical pulse increases only from 2.5 to 3.7 ps as opposed to an increase from 2.7 to 11.3 ps on a conventional microstrip line.
CC B1310 Waveguides; B5240D Waveguide and cavity theory
CT STRIP LINES; **WAVEGUIDE** THEORY
ST picosecond electrical pulses; microstrip line; ground plane; single-crystal silicon wafer; transmission line; reduced dispersion; active devices; silicon dielectric; rise time; 7 micron; 100 GHz; 5 mm;

```
     2.5 to 3.7 ps; CoSi2; Si
CHI  CoSi2 bin, Si2 bin, Co bin, Si bin; Si el
PHP  depth 7.0E-06 m; bandwidth 1.0E+11 Hz; distance 5.0E-03 m; time 2.5E-12 to
     3.7E-12 s
ET   Co*Si; Co sy 2; sy 2; Si sy 2; CoSi2; Co cp; cp; Si cp; Si; CoSi; Co

L1   ANSWER 7 OF 7  INSPEC  (C) 2003 IEE on STN
AN   1977:1011992  INSPEC     DN  A77012674
TI   Effects of grain boundaries on the hardening of lithium fluoride and iron
     silicide under dynamic loading.
AU   Guz', I.S.; Peretyat'ko, V.N.; Demina, G.S.; Gul'nyashkin, V.N. (Inst. of
     Problems in Mech. Engng., Acad. of Sci., Khar'kov, Ukrainian SSR, USSR)
SO   Strength of Materials (Feb. 1976) vol.8, no.2, p.209-11. 12 refs.
     CODEN: SMTLB5  ISSN: 0039-2316
     Translation of: Problemy Prochnosti (Feb. 1976) vol.8, no.2, p.82-4. 12
     refs.
     CODEN: PPCNBG  ISSN: 0556-171X
DT   Journal; Translation Abstracted
TC   Experimental
CY   Ukrainian SSR; USSR; United States
LA   English
AB   The authors consider the effects of grain boundaries on the hardening of
     lithium fluoride and iron silicide under dynamic loading in the
     microplastic deformation region. The specimens were LiF single crystals
     and bicrystals with inclined boundaries and coarse-grained iron
     silicide crystals. The LiF specimens were 50*60*5 mm and the Fe+3%
     Si, 300*30*0.5 mm. Loading was applied by the detonation of a 25-mg charge
     of PETN with 20-25 mu sec duration. An oscillogram is shown of the loading
     regime. To protect the LiF specimens from destruction, the load was
     applied via a waveguide and a dissipative backing was used for
     the absorption of the counter load reflected wave. The iron
     silicide specimens were loaded at a fixed distance (25 mm) from
     the boundary of an adjacent grain of size 25-30 mm.
CC   A6170N Grain and twin boundaries; A6220F Deformation and plasticity;
     A8140L Deformation, plasticity and creep
CT   GRAIN BOUNDARIES; HARDENING; IRON ALLOYS; LITHIUM COMPOUNDS; PLASTIC
     DEFORMATION; SILICON ALLOYS
ST   grain boundaries; hardening; dynamic loading; microplastic deformation
     region; inclined boundaries; oscillogram; waveguide; dissipative
     backing; counter load reflected wave; LiF; Fe-Si (3 wt.%)
ET   F*Li; LiF; Li cp; cp; F cp; Fe; Si; Fe*Si; Fe sy 2; sy 2; Si sy 2; Fe-Si


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     (FILE 'HOME' ENTERED AT 16:17:36 ON 21 SEP 2003)

     FILE 'INSPEC' ENTERED AT 16:17:44 ON 21 SEP 2003
L1            7 WAVEGUIDE (P)SILICIDE
L2            0 PHOTODETECTOR PHOTODIODE
L3       159873 DIODE OR DETECTOR
L4            2 L1 AND L3

     FILE 'STNGUIDE' ENTERED AT 16:20:22 ON 21 SEP 2003

     FILE 'INSPEC' ENTERED AT 16:22:54 ON 21 SEP 2003

     FILE 'STNGUIDE' ENTERED AT 16:22:56 ON 21 SEP 2003

=> file wpids
FILE 'WPIDS' ACCESS NOT AUTHORIZED
SESSION CONTINUES IN FILE 'STNGUIDE'
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=> l1
             0 WAVEGUIDE
             0 SILICIDE
L5           0 WAVEGUIDE (P)SILICIDE

=> waveguide and silicide
             0 WAVEGUIDE
             0 SILICIDE
L6           0 WAVEGUIDE AND SILICIDE

=> file ca
COST IN U.S. DOLLARS                               SINCE FILE      TOTAL
                                                        ENTRY    SESSION
FULL ESTIMATED COST                                      0.42      27.62

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FILE COVERS 1907 - 18 Sep 2003 VOL 139 ISS 13
FILE LAST UPDATED: 18 Sep 2003  (20030918/ED)

  This file contains CAS Registry Numbers for easy and accurate
  substance identification.


=> etching and waveguide and silicide
        134181 ETCHING
         31089 WAVEGUIDE
         47057 SILICIDE
L7          23 ETCHING AND WAVEGUIDE AND SILICIDE

=> msm or photodetector or detector or diode
           983 MSM
          6304 PHOTODETECTOR
        164895 DETECTOR
         57268 DIODE
L8      222235 MSM OR PHOTODETECTOR OR DETECTOR OR DIODE

=> l7 and l8
L9           6 L7 AND L8

=> d l9 1-6 all

L9   ANSWER 1 OF 6  CA  COPYRIGHT 2003 ACS on STN
AN   137:54415  CA
TI   High speed and high efficiency Si-based photodetectors using waveguides
     formed with silicides for near-IR applications
IN   Xu, Dan-xia; Janz, Siegfried
PA   Can.
SO   U.S. Pat. Appl. Publ., 10 pp.
```

CODEN: USXXCO
DT Patent
LA English
IC ICM H01L031-00
NCL 250214100
CC 73-11 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 76
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 2002079427	A1	20020627	US 2001-21081	20011219
PRAI	US 2000-257285P	P	20001226		

AB A **photodetector** is described comprising two sepd. **silicide** regions on a substrate and a **waveguide** of a silicon-based material formed between side-walls of the two sepd. **silicide** regions. A method of producing a **photodetector** having a **waveguide** of a silicon-based material is also described entailing depositing a metal layer on a silicon-based material layer of a substrate; **etching** to selectively remove unwanted regions of the metal layer; and heating the metal layer to induce a metal-silicon reaction to produce at least two sepd. **silicide** regions, at least two sepd. **silicide** regions forming the **waveguide** of silicon-based material. A method of producing a **photodetector** having a **waveguide** of a silicon-based material is also described entailing forming a ridge in a silicon-based material layer of a substrate and applying a mask on top of the ridge; depositing a metal layer on the silicon-based material layer of the substrate; heating the metal layer to induce a metal-silicon reaction to produce at least two sepd. **silicide** regions, at least two sepd. **silicide** regions forming the **waveguide**; and **etching** to selectively remove unwanted metal from the mask without affecting the at least two sepd. **silicide** regions. The Si-based photodetectors using waveguides formed with **silicide** regions may have high speed and high efficiency for near-IR applications.
ST IR **photodetector** ridge **waveguide** **silicide**
IT Optical detectors
(IR; high speed and high efficiency silicon-based photodetectors using waveguides formed with silicides for near-IR applications)
IT Semiconductor device fabrication
(high speed and high efficiency silicon-based photodetectors using waveguides formed with silicides for near-IR applications)
IT 7440-02-0, Nickel, uses 7440-06-4, Platinum, uses 7440-21-3, Silicon, uses 7440-33-7, Tungsten, uses 7440-48-4, Cobalt, uses 7631-86-9, Silica, uses 12623-02-8, Germanium 50, silicon 50 (atomic)
RL: DEV (Device component use); USES (Uses)
(high speed and high efficiency Si-based photodetectors using waveguides formed with silicides for near-IR applications)

L9 ANSWER 2 OF 6 CA COPYRIGHT 2003 ACS on STN
AN 131:329617 CA
TI Fabrication and characterization of ultrafast photodetectors
AU Loken, Michael
CS Inst. Schicht- Ionentechnik, Forschungszentrum Julich G.m.b.H., Julich, D-52425, Germany
SO Berichte des Forschungszentrums Juelich (1999), Juel-3687, 1-136 pp.
CODEN: FJBEE5; ISSN: 0366-0885
DT Report
LA German
CC 73-11 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 76
AB This work reports on the fabrication and characterization of ultrafast

vertical metal-Si-metal (**MSM**) Schottky-barrier photodiodes for the detection of visible and IR light. The devices are manufd. on an epitaxial buried CoSi2 ground plate on Si consisting of a high quality single cryst. Si layer sandwiched between the buried CoSi2 layer and a top semitransparent metal layer. For wavelengths <1.1 .mu.m, electron-hole pairs are generated in the Si. They are sepd. by an internal elec. field and accelerated towards the metal electrodes. For shorter wavelengths, Si becomes transparent and carriers are emitted from the internal semiconductor-metal interface. A photocurrent is produced. This so-called internal photoeffect is governed by different carrier dynamics: hot electrons or holes are injected from the metal layers into the Si. Their large excess energy leads to extremely fast elec. pulses. A new theor. model for the hot carrier dynamics inside the **detector** is proposed and examd. by detailed simulations. The resulting temporal response of the detectors was measured with a new setup, using a mode-locked Ti:Al2O3 laser and an optical parametric oscillator, which generates ultrafast optical pulses (170 fs) at IR wavelengths. At 820 nm the **MSM** photodiodes show an impulse response as short as 3.5 ps FWHM for Si(100) and 6.7 ps FWHM for Si(111). For the 1st time, the temporal response of **MSM** photodiodes was investigated at 1250 and 1560 nm wavelengths with femtosecond resoln. **MSM** photodiodes with different top metalization (Cr, Ti, and Pt) were analyzed. In addn., the dependence of the temporal response from the applied voltage, the temp., the dispersion on the microstrip line, and the area of the **detector** was studied. The exptl. results were interpreted with respect to the model proposed. The Ti/Si/CoSi2 photodetectors showed an elec. pulse response of 3.2 ps FWHM at 4 V bias. This is to our knowledge a record value. Furthermore, it is demonstrated that under certain conditions an even faster response can be achieved. At fiat band bias (no elec. field inside the **detector**) a very sharp pulse of 1.2 ps was obsd. Other important characteristics of the diodes (e.g. Schottky-barrier heights, dark current, quantum efficiency, responsivity, crystal quality of the layers) are presented. In addn. the coupling of a monomode glass fitter and a polymer-based **waveguide** to the **MSM** photodiode on 1 Si chip was realized and investigated. The manufg. processes are described and the exptl. coupling efficiencies are given.

ST silicon metal cobalt **silicide photodetector** fabrication characterization

IT Optical detectors
(IR; fabrication and characterization of ultrafast metal-Si-CoSi2 Schottky-barrier photodetectors for visible and IR radiation)

IT Sputtering
Sputtering
(**etching**, ion-beam, reactive; fabrication of ultrafast metal-Si-CoSi2 Schottky-barrier photodetectors for visible and IR radiation by)

IT Optical detectors
Schottky diodes
(fabrication and characterization of ultrafast metal-Si-CoSi2 Schottky-barrier photodetectors for visible and IR radiation)

IT Ion implantation
Photolithography
(fabrication of ultrafast metal-Si-CoSi2 Schottky-barrier photodetectors for visible and IR radiation by)

IT Electric current-potential relationship
Photocurrent
(of ultrafast metal-Si-CoSi2 Schottky-barrier photodetectors for visible and IR radiation)

IT **Etching**
Etching
(sputter, ion-beam, reactive; fabrication of ultrafast metal-Si-CoSi2 Schottky-barrier photodetectors for visible and IR radiation by)

[redacted]

IT 7440-06-4, Platinum, properties 7440-21-3, Silicon, properties
7440-32-6, Titanium, properties 7440-47-3, Chromium, properties
12017-12-8, Cobalt disilicide
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(fabrication and characterization of ultrafast metal-Si-CoSi2 Schottky-barrier photodetectors for visible and IR radiation)

RE.CNT 71 THERE ARE 71 CITED REFERENCES AVAILABLE FOR THIS RECORD

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L9 ANSWER 3 OF 6 CA
AN 129:295895 CA
TI Fabrication of integrated GeSi/Si superlattice PIN **photodetector** with Si **waveguide**
AU Li, Na; Xu, Xuelin; Li, Guozheng; Liu, Enke; Jiang, Zumin; Zhang, Xiangjiu; Wang, Xun
CS Surface Physics Key National Laboratory, Fudan University, Shanghai, 200433, Peop. Rep. China
SO Guangxue Xuebao (1998), 18(4), 471-473
CODEN: GUXUDC; ISSN: 0253-2239
PB Kexue Chubanshe
DT Journal
LA Chinese
CC 73-12 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 74, 76
AB A GeSi/Si superlattice structure was grown on an n+/n- Si wafer by MBE method. A GeSi/Si superlattice PIN **photodetector** and a Si **waveguide** were fabricated by reactive ion **etching**. The integration of the Si **waveguide** and the GeSi/Si superlattices PIN **photodetector** was carried out by a suitable process. The min. dark current of the **photodetector** was 0.8 .mu.A and the max. photocurrent was 2.7 .mu.A at a reverse bias of 5 V. The max. overall quantum efficiency of the **photodetector** was 14.2%. The working wavelength was 1.3 .mu.m.
ST integrated germanium **silicide** silicon superlattice **photodetector**; PIN superlattice **photodetector** germanium **silicide** silicon
IT Superlattices
(germanium **silicide**/silicon integrated with silicon **waveguide** as PIN photoelec. device)
IT Photoelectric devices
(p-i-n; germanium **silicide**/silicon superlattice integrated with silicon **waveguide** as)
IT Waveguides
(silicon; integrated with germanium **silicide**/silicon superlattices as PIN photoelec. devices)
IT 7440-21-3, Silicon, uses
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(integrated PIN photoelec. devices with superlattices of germanium **silicide** and)
IT 145998-02-3, Germanium **silicide** (GeSi)

RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(integrated PIN photoelec. devices with superlattices of silicon and)

L9 ANSWER 4 OF 6 CA COPYRIGHT 2003 ACS on STN
AN 127:128471 CA
TI Integration of Si electro-optic modulator and GeSi/Si heterojunction **detector**
AU Li, Guozheng
CS Xi'an Jiaotong Univ., Xi'an, 710049, Peop. Rep. China
SO Bandaoti Guangdian (1996), 17(3), 231-233, 237
CODEN: BAGUE5; ISSN: 1001-5868
PB Bandaoti Guangdian Bianjibu
DT Journal
LA Chinese
CC 73-11 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 76
AB A scheme of the integration of modulator and **detector** is proposed. First, Si rib **waveguide** electrooptic modulator was obtained on <100> n+-Si by conventional techniques such as epitaxy and two time diffusions. Secondly, on the output part of the **waveguide**, p-Ge0.6Si0.4/p-Si heterojunction **detector** in made by MBE and reactive ion **etching**.
ST integration silicon electrooptic modulator; germanium **silicide** heterojunction **detector** integration
IT Sputtering
(**etching**, reactive; integration of Si electro-optic modulator and GeSi/Si heterojunction **detector** fabricated using)
IT Electrooptical modulators
Optical detectors
Optical waveguides
(integration of Si electro-optic modulator and GeSi/Si heterojunction **detector**)
IT Diffusion
Epitaxy
Molecular beam epitaxy
(integration of Si electro-optic modulator and GeSi/Si heterojunction **detector** fabricated using)
IT **Etching**
(sputter, reactive; integration of Si electro-optic modulator and GeSi/Si heterojunction **detector** fabricated using)
IT 7440-21-3, Silicon, uses 12675-06-8, Germanium 60, silicon 40 (atomic)
RL: DEV (Device component use); USES (Uses)
(integration of Si electro-optic modulator and GeSi/Si heterojunction **detector**)

L9 ANSWER 5 OF 6 CA COPYRIGHT 2003 ACS on STN
AN 125:260728 CA
TI Silicon-**MSM photodetector** with integrated **waveguide**. Preparation and electrooptical characterization
AU Kim, Jin
CS Inst. Schicht- Ionentech., Forschungszent. Juelich G.m.b.H., Juelich, D-52425, Germany
SO Berichte des Forschungszentrums Juelich (1996), Juel-3233, 1-92 pp.
CODEN: FJBEE5; ISSN: 0366-0885
DT Report
LA German
CC 73-11 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 76
AB In this thesis a Si-based ultrafast **photodetector** was developed which is coupled onto an optical **waveguide** (SiO2). The

detector has a metal-semiconductor-metal structure; the layers (Si, CoSi2, SiO2 on Si(100)) are aligned vertically. The fabrication of the device including mol. beam allotaxy of the heterostructure, UV-photolithog., reactive ion **etching** of the **waveguide** and electrooptical characterization by time-resolved spectroscopy was decribed detailed, completed by the theor. basics.

ST silicon **photodetector waveguide** ultrafast fabrication electrooptic; cobalt **silicide** silicon silica heterostructure allotaxy

IT Laser radiation
   (allotaxy and electrooptical characterization by ultrashort laser pulses of a Si-based **MSM photodetector** with integrated wave guide)

IT Annealing
   Electrooptical effect
   Optical detectors
   (allotaxy and electrooptical characterization of a Si-based **MSM photodetector** with integrated wave guide)

IT Photoconductivity and Photoconduction
   (of Si/CoSi2 Schottky contact in Si/CoSi2/Si photodetectors)

IT Electric current
   (off-state; of Cr/Si and Si/CoSi2 Schottky contact in Si/CoSi2/Si photodetectors)

IT Electric contacts
   (Schottky, photocond. and off-state elec. current of Cr/Si and Si/CoSi2 Schottky contact in Si/CoSi2/Si photodetectors)

IT Sputtering
   (**etching**, reactive, structuring of SiO2 **waveguide** integrated in Si/CoSi2/Si **photodetector** by)

IT Vapor deposition processes
   (metalization, of Si/CoSi2/Si **photodetector** with integrated SiO2 **waveguide** by Cr)

IT Epitaxy
   (mol.-beam, allotaxy and electrooptical characterization of a Si-based **MSM photodetector** with integrated wave guide)

IT Waveguides
   (optical, allotaxy and electrooptical characterization of a Si-based **MSM photodetector** with integrated wave guide)

IT **Etching**
   (sputter, reactive, structuring of SiO2 **waveguide** integrated in Si/CoSi2/Si **photodetector** by)

IT Oxidation
   (thermal, of Si/CoSi2/Si in fabrication of **photodetector** with integrated SiO2 **waveguide**)

IT 12017-12-8P, Cobalt **silicide** (CoSi2)
   RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PNU (Preparation, unclassified); PRP (Properties); PREP (Preparation); PROC (Process); USES (Uses)
   (allotaxy and electrooptical characterization of a Si-based **MSM photodetector** with integrated wave guide)

IT 7440-21-3, Silicon, properties 7631-86-9, Silica, properties
   RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
   (allotaxy and electrooptical characterization of a Si-based **MSM photodetector** with integrated wave guide)

IT 7440-47-3, Chromium, uses
   RL: DEV (Device component use); USES (Uses)
   (vapor metalization of Si/CoSi2/Si **photodetector** with integrated SiO2 **waveguide** by)

L9 ANSWER 6 OF 6 CA

AN 115:81743 CA

TI Silicon/silicon-germanium heterostructures grown on SOI substrates by MBE

for integrated optoelectronics
AU Kesan, V. P.; May, P. G.; LeGoues, F. K.; Iyer, S. S.
CS T.J. Watson Res. Cent., IBM Res. Div., Yorktown Heights, NY, 10598, USA
SO Journal of Crystal Growth (1991), 111(1-4), 936-42
CODEN: JCRGAE; ISSN: 0022-0248
DT Journal
LA English
CC 73-11 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 75, 76
AB The structural, elec., and optical quality were investigated of epitaxial Si and SiGe films grown by MBE on SIMOX (sepn. by implanted oxygen) silicon substrates. Epitaxial films grown on these SOI substrates were characterized using planar and cross-sectional TEM, SIMS, and Seeco chem. **etching** to delineate defects. The first Si/SiGe integrated **waveguide-photodetector** for long wavelength applications were fabricated. Low reverse leakage current densities were seen in these device structures. The **detector** exhibited a responsivity of 0.43 A/W at 1.1 .mu.m with an impulse response time of 200 ps.
ST germanium silicon epitaxy optoelectronics
IT Electric property
Optical property
(of germanium-silicon and silicon epitaxial films on silicon-on-insulator substrates)
IT Optical detectors
(IR, germanium-silicon and silicon epitaxial films on silicon-on-insulator substrates)
IT Epitaxy
(mol.-beam, of germanium-silicon and silicon films on silicon-on-insulator substrates)
IT 7440-21-3, Silicon, properties 12675-06-8, Germanium **silicide** (Ge0.6Si0.4)
RL: PRP (Properties)
(elec. and optical and structural quality of epitaxial films of)
IT 7631-86-9, Silicon dioxide, uses and miscellaneous
RL: USES (Uses)
(epitaxial films of germanium-silicon and silicon with layers of)

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<<< SIMULTANEOUS LEFT AND RIGHT TRUNCATION AVAILABLE IN
    THE BASIC INDEX >>>

=> waveguide and silicide
         70397 WAVEGUIDE
          7980 SILICIDE
L10          7 WAVEGUIDE AND SILICIDE

=> saito
L11        307 SAITO

=>
=> waveguide
L12      70397 WAVEGUIDE

=> l11 and l12
L13          0 L11 AND L12

=> d his

     (FILE 'HOME' ENTERED AT 16:17:36 ON 21 SEP 2003)

     FILE 'INSPEC' ENTERED AT 16:17:44 ON 21 SEP 2003
L1           7 WAVEGUIDE (P)SILICIDE
L2           0 PHOTODETECTOR PHOTODIODE
L3      159873 DIODE OR DETECTOR
L4           2 L1 AND L3

     FILE 'STNGUIDE' ENTERED AT 16:20:22 ON 21 SEP 2003

     FILE 'INSPEC' ENTERED AT 16:22:54 ON 21 SEP 2003

     FILE 'STNGUIDE' ENTERED AT 16:22:56 ON 21 SEP 2003
L5           0 L1
L6           0 WAVEGUIDE AND SILICIDE

     FILE 'CA' ENTERED AT 16:27:15 ON 21 SEP 2003
L7          23 ETCHING AND WAVEGUIDE AND SILICIDE
L8      222235 MSM OR PHOTODETECTOR OR DETECTOR OR DIODE
L9           6 L7 AND L8

     FILE 'INSPEC' ENTERED AT 16:42:59 ON 21 SEP 2003
L10          7 WAVEGUIDE AND SILICIDE
L11        307 SAITO
L12      70397 WAVEGUIDE
L13          0 L11 AND L12
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